

UNCLASSIFIED



**Department of State
Federal Data Center
Consolidation Initiative Plan
(DOS FDCCI Plan)**

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1 Introduction

The Department of State (DOS) Data Center Consolidation (DCC) program is an on-going enterprise-level program managed by the Bureau of Information Resource Management (IRM). This program was established in 2002 to support the Department's global mission of providing "anytime/anywhere" access to information systems via consolidated infrastructure. In the interest of ongoing spending reduction efforts across the Federal government, this program has served to eliminate duplication of data center services and infrastructure while controlling or reducing energy and real estate costs without compromise to the goal of a highly sustainable IT infrastructure service.

The specific program goals have been, and continue to be, improved data center and server availability, scalability, security, sustainability, and cost containment. The program focuses on consolidating servers, data centers, and data center services. The overall scope of the effort is both Continental United States (CONUS) and Outside the Continental U.S. (OCONUS). These represent very different views of the world and are managed by two separate but integrated IT Resource Management initiatives within DOS: Global Information Technology Modernization Program (GITM) and Enterprise Server Operations Center (ESOC). To control duplication of effort, these two groups work closely and share workload in a way that supports centers of excellence or specialties within each group. GITM is the enterprise-wide lifecycle replacement program for the Department IT infrastructure addressing both CONUS and OCONUS sites. One aspect of the GITM program is the virtualization of the multiple IT infrastructure servers at OCONUS posts onto a local virtual infrastructure. The Department's Data Center Consolidation Program ESOC has focused on consolidating the enterprise-level CONUS data centers, seeing these as having the most immediate need thereby yielding the most substantive, immediate benefit. Therefore, throughout this paper we will address mainly the more recent CONUS or ESOC effort. Where elements of the GITM program contribute to the overall Department consolidation, they will be addressed and highlighted.

1.1 Domestic Data Center, Server, Service Consolidation

To achieve data center consolidation goals, the Department will consolidate CONUS servers into four data centers by the end of FY2015. Production servers will be located in two Tier III ESOCs – ESOC East and ESOC West – geographically separated and on separate power grids. Two other data centers in the Washington DC area will be repurposed: one for development systems and the other for a small number of specialized systems.

Server and service consolidation is occurring as an integral part of merging data centers. The Department is simultaneously pursuing cost avoidance and reduction through server virtualization, adoption of more efficient server hardware platforms, and standardization and automation of the processes used to support servers.

1.2 Overseas Network, Server, and Service Consolidation

In addition to the ESOC DCC program, which focused on consolidation of our CONUS enterprise data centers, the Department has completed a multi-year effort by the GITM program to standardized infrastructure servers and desktops at DOS OCONUS locations (e.g. embassies and consulates). This effort followed on the heels of a DOS program to improve and consolidate management of the worldwide intranet.

This GITM effort has now moved on to consolidating servers at foreign posts onto a virtual infrastructure. Multiple stand-alone will be replaced by a virtual infrastructure that will

consolidate servers onto an integrated platform. This effort is leveraging the server virtualization expertise gained through the ESOC DCC server consolidation effort.

1.3 DOS IT Strategy, Cloud Computing, and Consolidation

The DOS IT strategic goals are designed to support the dual Department objectives of Worldwide Diplomacy and American Citizen Services. As the various dimensions of cloud computing take shape over the next few years, the overall cloud model will function as both a driver and a catalyst to further consolidation. The Department's IT Goals specifically serve both to direct and to energize the domestic and overseas efforts.

- Goal 1, Digital Diplomacy – applying modern tools of social networking and value-added information resources to the challenges of diplomacy and development. Digital Diplomacy will enable enhanced collaboration and information sharing among our internal and external stakeholders.
- Goal 2, Cloud Computing – providing global access to all IT systems and information via a robust, worldwide, web-based infrastructure. State's cloud will include the Foreign Affairs Network, an evolving and growing platform capable of supporting all U.S. agencies operating overseas under Chief of Mission authority.
- Goal 3, IT Leadership – ensuring effective governance of all IT resources, domestic and overseas, and focusing on accountability to our customers for excellence in performance and service delivery.

As noted in Goal 2, the Department is incorporating the concepts of cloud computing into its support systems. Current work is focused primarily on Infrastructure as a Service (IaaS), but the Department has begun the planning required to improve and enhance efforts in the areas of Platform as a Service (PaaS) and Software as a Service (SaaS).

1.4 FDCCI Data Verification, Data Limitations

The baseline asset inventory is based on a survey of data center managers, initially conducted in 2007 and validated in 2010. As each data center moves from Stage 3: Migration Planning and into Stage 4: Migration Execution, the DCC program management office begins physical inventories on a monthly basis. This inventory primarily serves as a program management metric to ensure that we are on track for transitioning servers from the data center in time to support the decommissioning of the room, but it also serves as a very accurate verification of the inventory.

The data in the inventory was generally gathered from the primary source. Where data was not available, estimates and averages were used. Estimates were used for the size of the server closets and number of servers at overseas sites. DOS also used estimates for real estate cost per square foot: as most of our data centers are in government-owned facilities in urban areas, we based the cost on the average rental rate for Class A office space in that location.

2 Department Goals for Data Center Consolidation

Many of the enterprise applications and network services for supporting the Worldwide DOS objectives are enabled by more than 3,500 servers residing in 12 data centers in the United States. Continuing its current efforts over the next four years, the ESOC DCC program plans to consolidate, optimize, and repurpose or decommission more than 70% of the data centers currently in operation to achieve the goals described in the table below.

Overseas the servers are housed at most embassies and consulates in small server rooms or closets. The current efforts for that community will be to virtualize the key infrastructure servers required at post. That effort will take a minimum of four years which is the average lifecycle to refresh all posts worldwide. Over time, the Department will be assessing the benefit of overseas regionalization. Regionalization, a program to establish regional services that reduces the Department's overseas server footprint and improves information security, will parallel the ESOC DCC effort in form and function. At the present time, however, bandwidth costs and the connectivity quality/reliability are pervasive roadblocks to full scale worldwide regionalization and/or domestic centralization.

The benefits of both of these consolidation efforts, CONUS and OCONUS, are highlighted below in Table 1 DCC Program Goals. Our response to the FDCCI Strategic Objective to Reduce Cost is addressed in the Department's DCC Program Goal to Improve cost containment. Additional costs saving goals are addressed in Appendix B in the Planned Program Cost savings table.

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Table 1 DCC Program Goals

Federal DCCI Strategic Objective	Department DCC Program Goal	Department DCC Program Focus Areas and Objectives	Quantitative Targets	Qualitative Benefits
Reduce Cost	1. Improve cost containment	<ul style="list-style-type: none"> • Data Center, Server and Services Consolidation • Reduce/Optimize energy use • Reduce operational costs per server • Limit long-term capital investments • Process Automation 	<ul style="list-style-type: none"> • Number of Department domestic data centers reduced to four • All data centers operating at a Power Usage Effectiveness (PUE) range of 1.3 – 1.6 • Staffing remains relatively constant at the 2012 level through 2014 while consolidation efforts continue • Implement resource accounting system by 2014 	<ul style="list-style-type: none"> • Demonstrating fiscal responsibility and cost efficiency • Greater funding focus on Department's mission activities of Diplomacy and Citizen Services
Reduce Environmental Impact	2. Improve environmental sustainability of operations	<ul style="list-style-type: none"> • Data Center and Server Consolidation • Reduce power consumption per unit of processing capacity • Optimize cooling, power distribution, monitoring • Achieve Data Center-related goals set forth in Agency Sustainability Plan, Goal 9: Electronic Stewardship and Data Centers. 	<ul style="list-style-type: none"> • 70% of servers hosted on virtual infrastructure by 2015 • ESOC West accredited at the Leadership in Energy and Environmental Design (LEED) silver level • 25% of posts critical server infrastructures virtualized – Full deployment in 2015 	<ul style="list-style-type: none"> • Reduced power consumption and green house gas emissions • Reduced cost • Reduced power consumption in all OCONUS DOS posts

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Federal DCCI Strategic Objective	Department DCC Program Goal	Department DCC Program Focus Areas and Objectives	Quantitative Targets	Qualitative Benefits
Improve Efficiency & Service Levels	3. Improve operational efficiency	<ul style="list-style-type: none"> • Data Center Services Consolidation • Implement Information Technology Infrastructure Library (ITIL)-based processes to support breadth of ESOC operations • Implement an Enterprise Service Management tools suite to support and measure ESOC service processes 	<ul style="list-style-type: none"> • All systems monitored for availability through common system • 98% of server outages escalated to system owner within 10 minutes • 70% of systems using common backup solution • System configuration fully managed under ITIL-based processes • Consolidated team supporting both CONUS and OCONUS virtual infrastructure • Reduced hardware inventory overseas resulting in lower shipping costs 	<ul style="list-style-type: none"> • Higher and consistent level of service provided to customers • Reduced cost for higher level of service • Improved security through fewer, more standard platforms • Centralized team provides center of excellence for support
Enhance Business Agility	4. Improve IT infrastructure services	<ul style="list-style-type: none"> • Data Center, Server and Services Consolidation • Expand ITIL management practices to measure customer satisfaction • Grow cloud computing across the three service areas: IaaS, PaaS, and SaaS. 	<ul style="list-style-type: none"> • Virtual Systems provisioned on demand within 24 hours • Support for private, partner, and public cloud services as required • Implement continuous feedback loop with customers that reports customer satisfaction to State governance authority • Use of virtual infrastructure overseas will be expanded in time to support limited local deployment of virtual infrastructure. This will bring IaaS directly to remote locations 	<ul style="list-style-type: none"> • More responsive service provided to customers • Better insight into service provided to customers and achievement of service level agreements • Faster and better service to American citizens • Sharing of processes and information across Government Agencies

3 Implementing Shared Services/Multi-tenancy

The DOS has numerous initiatives focused on providing shared services/multi-tenancy. The Department has a long history of providing services to separately funded organizations as well as other government agencies. On the domestic side, the Department has numerous key initiatives in play designed to consolidate service and support. These initiatives range in cost, duration, and state of completion. The purpose of this section is to broadly introduce the existing initiatives and then turn our attention to the primary purpose of the paper: data center, server, and services consolidation. Table 2 provides an overview of each of the programs, the goals of the program, stakeholders, and the general quantitative and qualitative delivery expectations as currently established.

Table 2 Department Shared Services Programs

Program	Goals	Stakeholders	Quantitative Benefits	Qualitative Benefits
IT Desktop Consolidation	Centralize domestic desktop management including file, print, e-mail, and desktop operating system	Domestic DOS users	Ultimately, reduced cost per desktop	Centralized management Standard desktop managed environment – more secure
FAN	Foreign Affairs Network (FAN) supporting multiple agencies on Department OpenNet	All agencies that interact with DOS at post	Reduced network costs for other agencies operating overseas	Improved worldwide network service
Regionalization	Establish overseas regional services	Qualified Overseas Posts	Reduces server footprint and power consumption	Improved availability and security, better response, and overall reduced bandwidth cost
GITM Virtualization Program	Global Modernization of Overseas Infrastructure	Overseas Posts	Reduced server footprint and power consumption Reduced desktop footprint as desktop virtualization program begins Improved sustainability	Centralized management of overseas server infrastructure as a service Improved patch and security management at high risk posts
Security Services	Establish centralized network perimeter and enclave security	Worldwide OpenNet community	Reduce number of individual Local Area Networks (LANS) that require physically separate networks	Improved access across agency through shared infrastructure

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Program	Goals	Stakeholders	Quantitative Benefits	Qualitative Benefits
SMART	Centralized messaging	Worldwide Users of DOS Cable system	Reduced post hardware and software	Improved availability More feature rich system Central management
Data Center Consolidation	Consolidate domestic data centers, servers, and enterprise data center services	Domestic Infrastructure and server owners	Reduced footprint, particularly in high rent district of Washington, DC Managed Power and improved power utilization	Centralized server support for IaaS More scalable and secure
Application Level Shared Services	Provided support for Enterprise Microsoft Office Sharepoint Server (MOSS) implementation as well as local post shared administrative tools	Worldwide DOS Users	Central support for key department operational data	Improved services for data management
Security Management	Centralize management and reporting of worldwide windows network	Worldwide DOS Users	Reduced cost through centralized patch distribution, intrusion detection system (IDS), and antivirus Reduced vulnerability at the desktop level demonstrated by reduced network intrusions	Improved patch and security management worldwide

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For purposes of the FDCCI, the primary focus of this planning document is the CONUS Data Center Consolidation. The Data Center Consolidation effort works in concert with each of these programs to ensure that Data Center, Server, and Services consolidation potential is realized in each program. The following chart outlines the shared program services that the Department DCC has with each of these separate programs.

Table 3 Shared Services Alignment to DCC Program

Program	ESOC DCC Alignment
IT Desktop Consolidation	Data Center Consolidation provides centralized housing for servers such as file, print, e-mail, Dynamic Host Configuration Protocol (DHCP), messaging, and active directory
FAN	As the FAN expands to include more agencies, the possibility of hosting partner systems either domestically or overseas will be assessed. Currently this initiative is predominantly focused on network consolidation
Regionalization	As regional centers are established, the ESOC DCC program will provide support for virtualization
GITM Virtualization Program	Global Modernization of Overseas Infrastructure, Server Virtualization
Security Services	Establish centralized network perimeter and enclave security
SMART	This government wide messaging system is housed within the DCC ESOC and makes use of the virtual infrastructure provided by the DCC
Application Level Shared Services	Domestic servers that support these shared application systems are housed in the DCC ESOC. Overseas systems will be migrated to the GITM Virtual Infrastructure as it rolls out over the next four years
Security Management	All systems associated with this effort are housed within the DCC ESOC data centers and make use of the virtual infrastructure

Within this context, data center, server, and enterprise data center services needed to support these goals are provided by the ESOC DCC in support of the programs noted above. For instance, currently the Department houses systems from multiple agencies. In addition, the Department DCC program provides support for access to community networks. Through these shared government networks, the Department is able to share information amongst the larger U.S. federal community. This arrangement as well as other shared services initiatives will be enhanced through the combined FAN and DCC programs. The direction to expand and grow both network and data center services to the broader federal community as required by the FDCCI is in concert with the Department's 2010 IT Strategic Plan and is actively being implemented by the Department's programs noted in this section.

Each of these shared services programs is a large and complex set of projects all moving forward in their own tracks but governed by the strategic plans noted above. The purpose of this paper has been to address in detail only the Data Center Consolidation portion. To that end, further elaboration on the other programs will be limited to those areas where there is a direct bearing on the ESOC DCC plan.

4 Department Approach, Rationale and Timeline

The Department's CONUS data center consolidation strategy is to consolidate all domestic data centers into four enterprise data centers. Figure 1 presents the current Master Plan Schedule for the program that is used to manage the DCC program. The first four rows are the "target" data centers. The fifth row contains the "source" data centers that will be consolidated and decommissioned. For completeness, rows six and seven add the Department's plans for OCONUS and other smaller CONUS sites.

The Department's domestic strategy – two geographically dispersed production data centers plus two additional repurposed data centers for development networks and specialized systems – will position the Department for the next 10 years, at a minimum. Consolidation of services, including virtualization at OCONUS sites, will allow the Department to mature service delivery and support processes and monitor and manage the true costs of data center IT services. Once established, the production data centers will provide the highly available, highly accessible data centers required to host cloud computing services for the Department and for other Foreign Affairs agencies.

Figure 1 Master Plan Schedule

Facility	FY10	FY11	FY12	FY13	FY14	FY15	FY16
ESOC EAST (EE)	500 Systems DMZ/FW/PKI	500 Systems	500 Systems	500 Systems	40 Gb Core Upgrade	Refresh VI	
ESOC WEST (EW)	Design & Building Construction		Core Install Completed 500 Systems	1000 Systems	1000 Systems 40 Gb Core Upgrade		Refresh VI
			DMZ/FW/PKI	Construction of 2nd Pod			
BIMC (SA26) Repurpose	Planning Complete DevLan Alpha Test	DevLan Beta Test	DevLan in Production BIMC Reprovisioned				
OLD WAR (HST 3684) Repurpose		Design	Construction to Repurpose Online				
FDCCI Decommission	HST 2530 (CBPC)	HST 1720 (ESOC) SA3, SA6, SA44	SA1, HST 5241 (NCC)	HST 5440	SA 20	Charleston	
OCONUS		Virtualize 70 Posts	Virtualize 110 Posts	Virtualize 110 Posts	Virtualize 110 Posts	Virtualize 45 Posts	
Bureau-Specific CONUS Sites			Develop Design / Plan		Consolidate Infrastructure		

The Master Plan Schedule is designed to highlight four elements of the data center consolidation effort across the program time line: capital equipment purchases (500 systems, 40 Gb network upgrade, etc.), service offerings (DMZ support, Development LAN), decommissioning strategy (HST 5440 in FY13), and end state capacity/service orientation (Intranet, Development LAN, etc). These are planning guidelines used for resource and budget planning. These four elements and the timing are assessed annually and adjustments will be made. This allows the program to proceed in a progressively elaborated fashion, allowing mid-program adjustments as unforeseen challenges are encountered. Within this plan and not displayed but noted previously, Data Center Consolidation is simultaneously pursuing two supporting strategies: server consolidation and data center services consolidation.

The server consolidation component seeks to reduce physical servers by merging like servers and consolidating these and all other systems into an enterprise virtual infrastructure. This strategy reduces unused capacity and total cost of ownership by lowering power costs, server hardware costs, acquisition costs and the data center footprint along with their related environmental impacts. The Department plans to virtualize 50% of servers over the next three years, with a longer-term goal of 70% server virtualization. Services consolidation is designed to address the need for common services, such as backup, once servers are housed in centralized

facilities. The IT Services Consolidation effort is an ongoing part of the overall data center consolidation program.

As the program began, two primary alternative consolidation cost benefit analyses were conducted by the DCC Program Management Office (PMO): the first to determine the overall DCC requirements and strategy; the second to develop an acquisition strategy for ESOC West.

The first study was the *U.S. Department of State Business Case Analysis, Enterprise Data Center Strategy Study, 20 March 2008*. The purpose of the study was to conduct a business case analysis to support the development of a data center consolidation strategy. The recommendation of the study was that the Department's servers be transitioned into two geographically dispersed Tier 3 commercially owned facilities. The intent was to improve overall service and reduce delivery time by obtaining services from an established vendor. This is the strategy that the Department embarked on in late 2008. The goal was to deliver the first commercially supplied service in 2009 and the second in 2012. DOS also chose to retain a third existing facility in the Washington, DC area to function as an alternative site. The first site, ESOC East went production in 2009.

After the first site was installed, the Department was challenged with the issue of preparing for the second site in 2012. At that time, the American Recovery and Reinvestment Act (ARRA) became available as a possible option to build a federally owned data center in the necessary time frame. This led to a second smaller study which examined options for the acquisition of an ESOC West Data Center. A number of strategies were explored, including the use of military properties excessed via the Base Realignment and Closure (BRAC) process, obtaining a commercial service again like ESOC East, purchasing land, or the Department leasing land. After an analysis, the final strategy of leasing land on a GSA-owned campus was selected. The strategy best achieved the overall ARRA objectives, including near-term job creation, and supported the Green Data Centers initiatives as articulated in the Agency Sustainability Plan. A location was selected that offered geographic and power-grid diversity, communications infrastructure, ideal climate conditions, minimum concern for natural disasters, and cost effective power. As the ARRA program came to fruition, this provided needed funding for the Department to set the plans in place to pursue the two additional Washington, DC based data centers that would house development networks and specialized systems, thereby completing the overall high level data center strategy.

The primary OCONUS consolidation activity is the consolidation of physical servers at post onto a virtual server infrastructure. Each OCONUS site will be served by a local, integrated platform located within the site's small server room or closet. The virtual server platform will be implemented at all OCONUS sites.

This effort is being implemented by GITM program, which is the Department's enterprise-wide lifecycle replacement program for IT infrastructure. The virtualization program began in FY11 and will take four years to implement at all OCONUS sites.

The goal of the GITM OCONUS virtualization project is reduce server footprint and power consumption, improve sustainability, and streamline server support processes.

5 Department Governance Framework for Data Center Consolidation

The DCC effort is managed by the DCC PMO in the System Integration Office (SIO) of the IRM Bureau. The DCC PMO uses Project Management Institute (PMI)-based project management

methods for initiating, planning, executing, controlling and monitoring, and closing projects. Under the umbrella of the DCC program, a number of concurrent projects are being executed at any given point in time.

The DCC PMO uses three layers of transition planning, and out of these processes, consensus is reached regarding the disposition of each system and each data center.

Transition Plan	Description
Data Center Transition Plan (DTP)	Overarching projects to migrate all systems out of a data center and either decommission or repurpose that data center. Vertical planning to address the consolidation of all components within a data center.
Customer Transition Plan (CTP)	Projects to analyze, plan, and oversee the execution of migrations of the full range of systems for a particular customer. Horizontal planning to ensure customer needs / service levels are addressed.
System Transition Plan (STP)	Project to plan, execute, and monitor a specific system's transition to a new data center. Tactical process to ensure each transition is well managed and efficient.



Figure 2 Transition Planning Processes

The DCC program maintains metrics at multiple levels: system and process performance. Process performance level metrics are gathered from across the program, measuring achievement towards strategic and tactical goals and ongoing operational efficiencies. System performance metrics include the Response Times of critical applications (such as Microsoft Office SharePoint Server) and the CPU and Storage utilization of the Virtual Infrastructure. Process performance metrics maintained include the time-to-process virtual server requests and the accuracy of Virtual Machine Request Forms.

An Information Technology Infrastructure Library (ITIL)-based Enterprise Service Management tool suite is being implemented to support ESOC operations. This suite will streamline configuration and change management and will enable the ESOC to more accurately allocate costs and report service levels provided to ESOC customers. The tool suite will also enable ESOC managers to identify areas for improvement to achieve greater operational efficiencies.

System level statistics are also addressed, including energy consumption and power usage effectiveness (PUE). These statistics are used to estimate environmental impacts such as reduced greenhouse gas emissions. The metrics are gathered weekly for internal program consumption and published monthly to a wider audience that includes senior management.

Department-level IT governance is provided by the E-Government Program Board (E-Gov PB). This board provides senior-level guidance to the Under Secretary for Management that

addresses the full range of Department E-Gov and IT investment portfolio and project management activities. The E-Gov PB has three primary purposes:

1. Prioritize and resolve significant policy, strategic and resource issues concerning the Department's investments in E-Gov and IT initiatives.
2. Drive innovation in the use of technology while effectively managing E-Gov/IT capital decisions; and
3. Ensure systematic selection, control, and evaluation of all the Department's E-Gov/IT programs and investments, as required by law and OMB mandates.

The E-Gov PB provides an enterprise wide investment review, decision making, and governance process, which maximizes the value and mitigates the risk associated with complex, central, de-central, and concurrent information technology initiatives and acquisitions.

5.1 Cost-benefit Analysis

5.1.1 CBA Approach

The DOS entered into the Data Center Consolidation plan with in anticipation of the fact that the consolidation would have significant front-loaded costs but when executed properly will provide superior service and cost avoidance or reduction over time. Given the dynamic nature of the task, the industry, and federal funding cycles, the budget and expected cost model must be approached with a view toward adjustments. To that end, the program has been designed to invest in capital improvements, including buildings, servers, and services that will allow growth through a scalable planning and implementation approach.

The plan to address the variable nature of this program included a threefold approach to cost containment and possible reduction:

1. **Cost Avoidance** – this was the first focus and materialized primarily through virtualization.
2. **Cost Control** – Much of the cost of the data centers was “hidden” through various distributed organizations. The program has sought through centralization of costs and resource accounting to obtain an accurate picture of the true cost of the service. The DCC is preparing to implement a cost allocation system that will clearly allow the DOS to evaluate the service delivery on a cost basis.
3. **Cost reduction** – Over time the ability to both control and possibly reduce costs will be achieved in the out years as operations assumes steady state and support activities can be streamlined.

The budget for this architecture has been expressed in terms of the table below which presents the Operating Expenses (OPEX) and Capital Expenses (CAPEX) required to establish, refresh, operate, and maintain the Department's domestic enterprise data centers. The overseas component of consolidation is not covered in this section as that program has a separate cost structure in place and is funded accordingly. Improvements in that program are being considered separately.

The domestic costs below are estimates used for analysis; with the exception of CY+1, these are not budget request numbers that have gone forward.

5.1.2 CBA Budget

As noted in the table below, the estimated data center OPEX costs increase over the coming years from \$25M in FY10 to \$32M in FY15. Currently, as utilization of the ESOCs expand and

higher service levels are achieved, the DCC estimates that the growth in total OPEX costs will hold to roughly the rate of inflation. The overall cost increase is a result of improved service levels in the new and more expensive Tier 3 data centers. This new level is required to achieve the SLAs required by DOS data center customers. In the original study, the need for improved and high availability data centers was identified as the ESOC Customers' number one priority. Specifically, the requirements identified in the original study were as follows.

- **Establish high availability data centers:** systems transitioning from Tier 2 (or worse) data centers to enterprise-class Tier 3 data centers; 100% availability SLA for power and environmental; 24x7 ESOC support staff; high availability network design; geographically dispersed; high speed replication between sites
- **Maintain security:** all servers will be hosted in secure facilities with 24x7 Diplomatic Security Uniformed Guards
- **Scalability:** support future Department requirements, even if unforeseen, and do so in an acceptable time frame
- **Cost containment of a centralized data center budget;** establish costs, develop a cost recovery system, control cost growth and reduce if possible

The Budgeted Costs for End-State Target ESOCs includes the following CAPEX costs between now and FY15:

- **FY11:** ESOC West, DevLan, and VI Buildout IT Infrastructure - \$12M
- **FY12:** ESOC West scale out and lifecycle maintenance - \$8M
- **FY13:** ESOC West 2nd Pod - \$40M
- **FY14:** ESOC East and West Network Core to 40 Gb - \$10M
- **FY15:** Virtual Infrastructure lifecycle refresh - \$15M

One of the critical elements of the program is the cost avoidance from the virtualization program. We estimate that the Department will be able to reallocate over \$8M per year once the transitions are complete and steady state has been achieved at the ESOCs. The table below presents the cost avoidance through server virtualization. The source of our calculation was a "green calculator" that VMWare makes available to estimate costs savings associated with transitioning from physical to virtual servers.

Table 4 DCC Cost Estimates show four general areas: end state cost estimate for the four domestic data centers, current OPEX for data centers to be decommissioned, total cost estimate (previous to added), and cost avoidance. The table includes ARRA funding as a CAPEX expense in FY09 and FY10. These costs are aggregate estimates of the full DCC costs, which span several organizations and funding sources. The costs do not directly reflect the Department's budget requests.

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Table 4 DCC Cost Estimates

	FY09 (\$K)	FY10 (\$K)	FY11 (\$K)	FY12 (\$K)	FY13 (\$K)	FY14 (\$K)	FY15 (\$K)
Budgeted Costs for End-State Target ESOCs							
OPEX	\$ 12,295	\$ 22,789	\$ 20,436	\$ 28,367	\$ 30,008	\$ 30,908	\$ 31,836
CAPEX	\$ 31,760	\$ 102,712	\$ 12,214	\$ 7,900	\$ 40,000	\$ 10,000	\$ 15,000
Total	\$ 44,055	\$ 125,501	\$ 32,650	\$ 36,267	\$ 70,008	\$ 40,908	\$ 46,836
Estimated Costs for Data Centers to be Decommissioned							
OPEX (including Labor)	\$ 6,531	\$ 6,531	\$ 6,375	\$ 4,977	\$ 3,892	\$ 3,392	\$ 779
CAPEX (server lifecycle replacement)	\$ 1,159	\$ 1,159	\$ 1,159	\$ 1,101	\$ 427	\$ 257	\$ 93
Total	\$ 7,690	\$ 7,690	\$ 7,534	\$ 6,078	\$ 4,319	\$ 3,649	\$ 872
Total Data Center Costs							
OPEX	\$ 18,827	\$ 29,320	\$ 26,812	\$ 33,344	\$ 33,900	\$ 34,301	\$ 32,614
CAPEX	\$ 31,760	\$ 102,712	\$ 12,214	\$ 7,900	\$ 40,000	\$ 10,000	\$ 15,000
Total	\$ 50,587	\$ 132,032	\$ 39,026	\$ 41,244	\$ 73,900	\$ 44,301	\$ 47,614
Costs Avoided							
OPEX Costs Avoided via Decommissioning DCs	\$ -	\$ -	\$ 156	\$ 1,554	\$ 2,639	\$ 3,139	\$ 5,753
CAPEX Costs Avoided through Virtualization	\$ -	\$ 782	\$ 1,477	\$ 2,065	\$ 3,539	\$ 4,986	\$ 5,817

5.1.3 Sources of Funds

The amounts noted above represent estimates in an attempt to show the costs in the three broad categories: OPEX, CAPEX, and DCC. Currently, ESOC is including requests for the majority of this funding in their annual requests. The major exception is FY12, which is included in the A Bureau (Facilities) budget. We are planning to begin a program of chargeback, but must plan it and roll it in such a way that bureaus can appropriately budget. The current proposed rollout plan is shown in Table 5 below.

Table 5 – Cost Recovery Implementation Timeline

	FY10	FY11	FY12	FY13	FY14	FY15	FY16
Funding Model	CIF Funded				Full Cost Allocation		
Implementation Lifecycle	Planning		Trial		Production		
Deliverables	Remedy Implementation		Cost Reporting		Collect Funds		

5.2 Risk Management and Mitigation

An integral part of the PMI-based project management methods used by the DCC PMO is identification, analysis, reporting, and tracking of project risks. The risk management processes used by the DCC PMO are described in detail in the DCC Program Management Plan. An overview of these processes is described below.

Project level risks are initially identified during Project Planning activities by the DCC PMO and Matrix Managers and are tracked via a standard Risk Register on each project's website portal.

Project managers and the Matrix Managers of project teams continue to identify risks through the life of the project via evaluation of milestone progress and status, specifically identifying risks that impact cost, schedule, or quality.

The objective of the Analysis activity is to convert risk data into decision-making information. In addition to a Description of each risk identified, the following characteristics are also assessed during the risk analysis phase: Likelihood, Impact, Trigger, Management Strategy, and Mitigation Strategy. Each of these characteristics is reported in the Risk Register, monitored as the project progresses and reassessed each week as part of the Project Status Reporting.

Any risks which are raised to "High" (project approaching trigger) or "Critical" (risk is realized or is certain to be realized) are also highlighted through Risk-type Project Taskers. These taskers

are presented on the project's website portal and reviewed at each status meeting. These taskers also appear in that project's Dashboard on the Program Status Report.

The DCC Program-wide Risk Register is shown on the following pages.

Department Initial Data Center Consolidation Plan

Table 6 DCC Program Level Risk Register

ID	Description	Likelihood	Impact	Trigger	Management Strategy	Mitigation Strategy
1	Funding not secured to continue to scale out data center infrastructure to support additional customers	Medium	High	New FY Budget passbacks do not include requested CAPEX funds.	<ol style="list-style-type: none"> 1. Continue capacity planning and budget forecasting to ensure that full CAPEX requirements are determined to support projected customer base. 2. Work with IRM Strategic Planning Office to ensure that DCC CAPEX budget requirements are included in each year's budget request. 	<ol style="list-style-type: none"> 1. Set expectations in customer outreach meetings that DCC budget may not support future requirements 2. Work with IRM Strategic Planning Office to accelerate plans to implement charge back program
2	Costs exceed budget estimates / funding not secured to operate and maintain ESOCs	Low	High	New FY Budget passbacks do not include requested OPEX funds.	<ol style="list-style-type: none"> 1. Continue capacity planning and budget forecasting to ensure that full OPEX requirements are determined to operate and maintain ESOCs. 2. Work with IRM Strategic Planning Office to ensure that DCC OPEX budget requirements are included in each year's budget request. 	<ol style="list-style-type: none"> 1. Work with IRM Strategic Planning Office to accelerate plans to implement charge back program 2. Scale back ESOC services
3	ESOC West not opened to support customers by FY12Q3	Medium	Medium	Design / Build project schedule or Core Infrastructure project plan projects that services will not be available on time	<ol style="list-style-type: none"> 1. Monitor Design / Build schedule on a weekly basis to ensure that timelines are being met and risks are be monitored. 2. Initiate ESOC West Core Infrastructure project in FY11Q4, integrating lessons learned from ESOC East Core Infrastructure project. 	<ol style="list-style-type: none"> 1. Set expectations in customer outreach meetings regarding revised ESOC West schedule 2. Use ESOC East and BIMC capacities to bridge gap in schedule
4	Customer requirements grow to exceed ESOC capacities	Low	Medium	Planned System Transitions (as projected via Customer Transition Plans) exceed ESOC capacities	<ol style="list-style-type: none"> 1. Continue Customer Transition Planning to validate and refine ESOC capacity plans. 2. Continue to advocate use of virtualization for all appropriate systems. 	<ol style="list-style-type: none"> 1. Proceed without documentation, initiate a later project dedicated to completing documentation 2. Slip facility acceptance and transition dates

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ID	Description	Likelihood	Impact	Trigger	Management Strategy	Mitigation Strategy
5	System owners do not move into ESOCs in accordance to the plan and schedule (including externally hosted applications)	Medium	High	Planned/Budgeted resources for migration	1. Step up market awareness	1. Reassess plan regularly 2. Make appropriate adjustments and publish
6	System requiring re-engineering to function in ESOC environment (latency and through put performance)	Low	Low	Monthly performance report increase in measured data	1. Establish standard measurement techniques 2. Make appropriate software reengineering recommendations	1. Establish fund and technical sources to accommodate
7	Potential out year cost increases to move from a consolidated /virtualized environment to a cloud environment	High	High	Customer feedback	1. Budget accordingly 2. Continue to evaluate the cost benefit and adjust outflows accordingly	1. Monitor budget
9	ESOCs are not meeting customer SLAs	Low	Medium	Reported service levels fail to meet more than 50% of customer SLAs two consecutive months	1. Measure and report service levels provided on a monthly basis. 2. Perform Problem Management to mitigate low service levels as discovered.	1. Establish ESOC-wide Problem Management tiger team to perform in depth analysis of why service levels agreements are not being met 2. Either revise processes, request additional resources to met service level agreements, or revise SLAs

5.3 Acquisition Management

The DCC PMO acquisition plan includes three primary components. Two components are the separate efforts to develop and execute strategies to acquire data center facilities for ESOC East and ESOC West. The third component is the ongoing acquisition of IT hardware, software, and services for the DCC program.

The high-level acquisition strategy for ESOC East was developed as part of an analysis performed on behalf of the Department in 2007. This analysis recommended that the Department lease colocation services from a commercial data center provider to establish the first of two Tier 3 enterprise data centers. This strategy was successfully executed in 2008 with the establishment of a long term contract with a leading data center services provider.

A number of acquisition strategies were explored for ESOC West, including the use of a BRAC site, leasing a commercial service, purchasing land, and leasing land. After much analysis, the final strategy of leasing land on GSA-owned campus was selected. The Design/Build phase of the establishment of ESOC West has followed GSA procedures. The GSA Contracting Officer (CO) is responsible for the execution of the Design/Build contract. DOS and GSA are actively involved in monitoring the project in cooperation with the agency of Construction Management Authority.

The third acquisition component of the DCC has been the ongoing acquisition of IT hardware, software, and services. A plan was developed for purchase of all IT purchases, including services to begin consolidation in anticipation of the new data centers. That plan included the cash outlays over the life of the implementation period and outlined the services and hardware/software that would be purchased. The Department's Office of Acquisitions Management was responsible for execution of the plan in conformance with the Federal Acquisition Regulations (FAR) and all Departmental policies and procedures. A part of that plan included the establishment of contracts providing enterprise licensing where appropriate. A foundation of the enterprise license structure has been through the use of GSA Schedule costs. Further cost reductions were negotiated based upon anticipated purchase amounts over the life of the consolidation efforts.

The acquisition authorities have worked to ensure that small businesses were adequately represented in DCC acquisitions. The Department's and GSA's Acquisitions Offices, Legal, and the Office of Small and Disadvantaged Business Utilization worked closely with the program and project managers to ensure all goods and services requirements are met in accordance with the FAR and all Departmental policies and procedures, including the security aspects as identified in 12FAM210. In addition to the established Department and GSA rules and regulations, there are additional "Recipient Reporting" requirement as specified by OMB. The RFP for the Design / Build of ESOC West followed specific guidelines that required the selected vendors to implement a small business plan where 30% of the project went to small business. This was successfully implemented.

5.4 Communications Strategy

The DCC Program uses a multi-tiered communication strategy to keep all levels of decision-makers informed regarding all aspects of the DCC Program, including the timeline for establishment of the new data centers, ESOC services being offered, cost allocations, and risks.

At the highest level are the E-Gov PB (described in Section 5) and Advisory Group (comprised of Bureau Executive Directors) which are critical in supporting and facilitating the successful

execution of this initiative. This forum will be used to ensure there is Department-wide participation in the enterprise initiative and that the requisite policy guidance is in place.

At the level is the DCC Program's outreach to Bureau Executive Directors. The DOS Chief Information Officer (CIO) has fully authorized the Data Center Consolidation Charter as expressed further in the programs official charter. In anticipation of the project, a round of briefings was held at the initiative of the DCC effort to inform Executive Directors of the programs goals and timelines and to obtain their support of the program. As ESOC West comes close to being brought online, a round of updated briefings will be presented to Bureau Executive Directors. Interim updates have also been presented as required.

The DCC Program keeps IRM management, including the CIO and the Deputy CIOs, abreast of DCC activities via a Weekly Activities Report (WAR) that details all significant program activities. IRM management and Resource Management decision makers are all also regularly briefed concerning financial status of the DCC program and upcoming budget requests.

The primary communications vehicles to ESOC customers are ongoing Customer Transition Planning projects. As described elsewhere in this plan, these projects analyze, plan, and oversee the execution of migrations of the full range of systems for a particular customer. As with other DCC projects, weekly status meetings are held to plan system transitions and to keep customers abreast of DCC activities.

Lastly, the DCC PM presents DCC overview briefings on a semi-annual basis at the weekly IRM Network Management Meetings. These briefings are open to all Department staff. These briefings are also recorded and can be streamed to desktop computers via BNET, the Department's internally broadcast television network.

6 Progress

6.1 FDCCI Consolidation Progress

The Department is on track to meet the 2011 amended targets. We decommissioned one data center and are on track to decommission three additional data centers by the end of the year. There is one data center that we will not be able to close as planned in 2011. Due to the inability of one key customer to transition a critical system, the closure of this data center has been moved to 2012. The Department informed OMB and GSA of this schedule change in July 2012.

The Department is on track to meet our 2012 targets. Most significant to the DCC effort is that we will close two data centers.

We remain on schedule for completion of our DCC effort in 2015:

- Our east coast data (ESOC East) has been operational since mid-2009: we have consolidated over 2,200 servers into it.
- Over 50% of the servers at ESOC East are virtual machines on our enterprise virtual infrastructure, exceeding the 20% target that we set for ourselves in our Sustainability Plan.
- Our western data center (ESOC West) is under construction and are on track for full production operations in mid-2012. It will be a LEED Gold certified facility.
- Together, these two Tier III data centers will establish a highly-available, scalable, and sustainable environment that will support the Department for over 20 years.

Our greatest success as a program is that we have been able to support over 2,200 servers in a modern, reliable, secure facility and have had the capacity to support our customer requirements in a timely manner, something that we could not have said several years ago. In short, we have substantially improved service levels, which was a key request of our customers. Unfortunately, this has come at increased cost. The starting point for the DOS consolidation was from multiple data centers that were not able to provide the availability and scalability requirements that systems such as Passport and Visa require.

We have also been able to exceed our virtualization goals: over 50% virtualized at ESOC East, 35% virtualized across all our data centers. This will allow us to reap cost benefits in the future as we ramp up these numbers to the capacity of our new infrastructure.

The primary challenge to achieving consolidation has been balancing resources between O&M and Consolidation: the more servers that we consolidate, the more we need to support. In a time of uncertain federal budgets, securing and prioritizing funding has been an ongoing issue. However, with senior management support we been able to fund our efforts as budgeted.

We have accelerated one aspect of our program: since the FDCC Initiative began, we have initiated an overseas virtualization effort. The effort has allowed us to extend management efficiency benefits of virtualization that we have already been realizing domestically to our overseas posts.

Regarding lessons learned, we have modified our tactical focus into a two pronged approach to consolidation, both of which we believe are critical for our ongoing success:

- **Customer outreach.** Obtaining customer buy-in, determining customer capacity requirements, getting commitments to timelines, and managing customer expectations. This is a day-in-day-out effort which is crucial to the success of a program this broad with this many stakeholders.
- **Focus on data-center-by-data-center closure.** We also have had focused efforts to close each legacy data center on a facility-by-facility basis. We believe that a directed effort for each data center is the only way accomplish closure of the room, otherwise day-to-day concerns and emerging customer requirements while drain the focus of the PMO team and kill the long-term schedule.

6.2 Cost Savings

The DOS remained within the FY11 budget for Data Center Consolidation and exceeded our cost avoidance goals (i.e. estimated costs avoided exceeded the projected costs avoided). Cost avoidance was primarily achieved through virtualization; it is estimated that the Department saved \$1.5M in FY2011 by avoiding the hardware and power costs associated with the physical servers that did not have to be purchased or powered. We estimate that the Department will be able to reallocate over \$5.8M per year once the transitions are complete and steady state has been achieved at the ESOCs.

It is also estimated that the Department avoided \$156K in operational costs by having turned down data centers in FY11.

Our primary long-term (four to five years) cost goal is to maintain constant OPEX costs as we increase the number of systems being centrally supported. We have currently not calculated the total cost benefits to the Department of being able to guarantee highly available and secure service to our customers, though the intangible cost of service outages at our legacy data

centers in the past has been high. Over time we expect to explore ways of addressing the return on investment to continue offering a higher level of service.

There were no significant unanticipated consolidation costs. The Department's enacted FY11 budget fully funded the DCC effort.